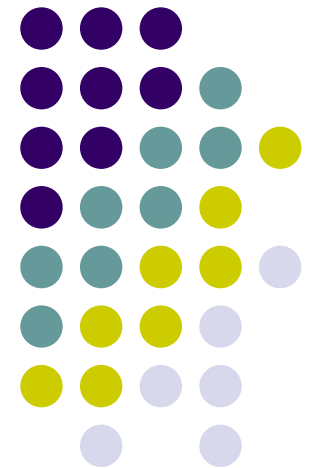


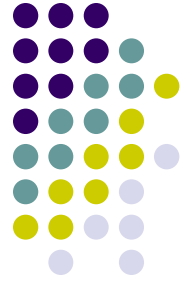
Tang Health Center

Monitoring Based Commissioning Project, 2008



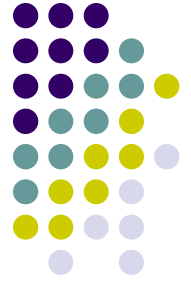
University of California, Berkeley





Topics of Discussion

- Project Summary
- Tang Health Center building and reasons for choosing as an MBCx project.
- Measures implemented during the project
- Verified savings
- Lessons learned
- Next steps



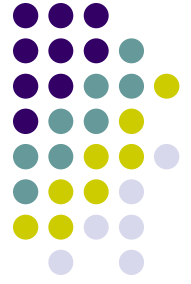
Project Summary

- Chosen because of high energy usage
- Models of baseline energy consumption were created
- Commissioning Activities and Results:
 - Worked closely with Air Systems Inc. to replace the existing non-functioning control system with a new ALC system
 - Commissioned the new control system and implemented four energy efficient control strategies
- Models of the post install energy usage were created

Baseline	Post-install	% Savings	Target % Savings
150 kBtu/sqft/yr	105 kBtu/sqft/yr	30%	15%

- Continued work on the building

The Building

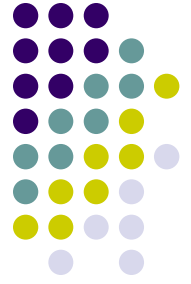


Basics

- UC Berkeley's Student Health center and a backup emergency center for the campus
- 75,000 ft²
- Energy Use Intensity: 150 kBtu/ft²-yr (typ. bldg ~ 80)
- Four variable volume DX units (w/ inlet guide vanes)
- One boiler for space heating
- Open Monday thru Saturday

Reasons for choosing

- The building had non-functioning control system, no economizer operation, and scheduling functions.
- 24/7 operation.
- The DX units had not been inspected for many years

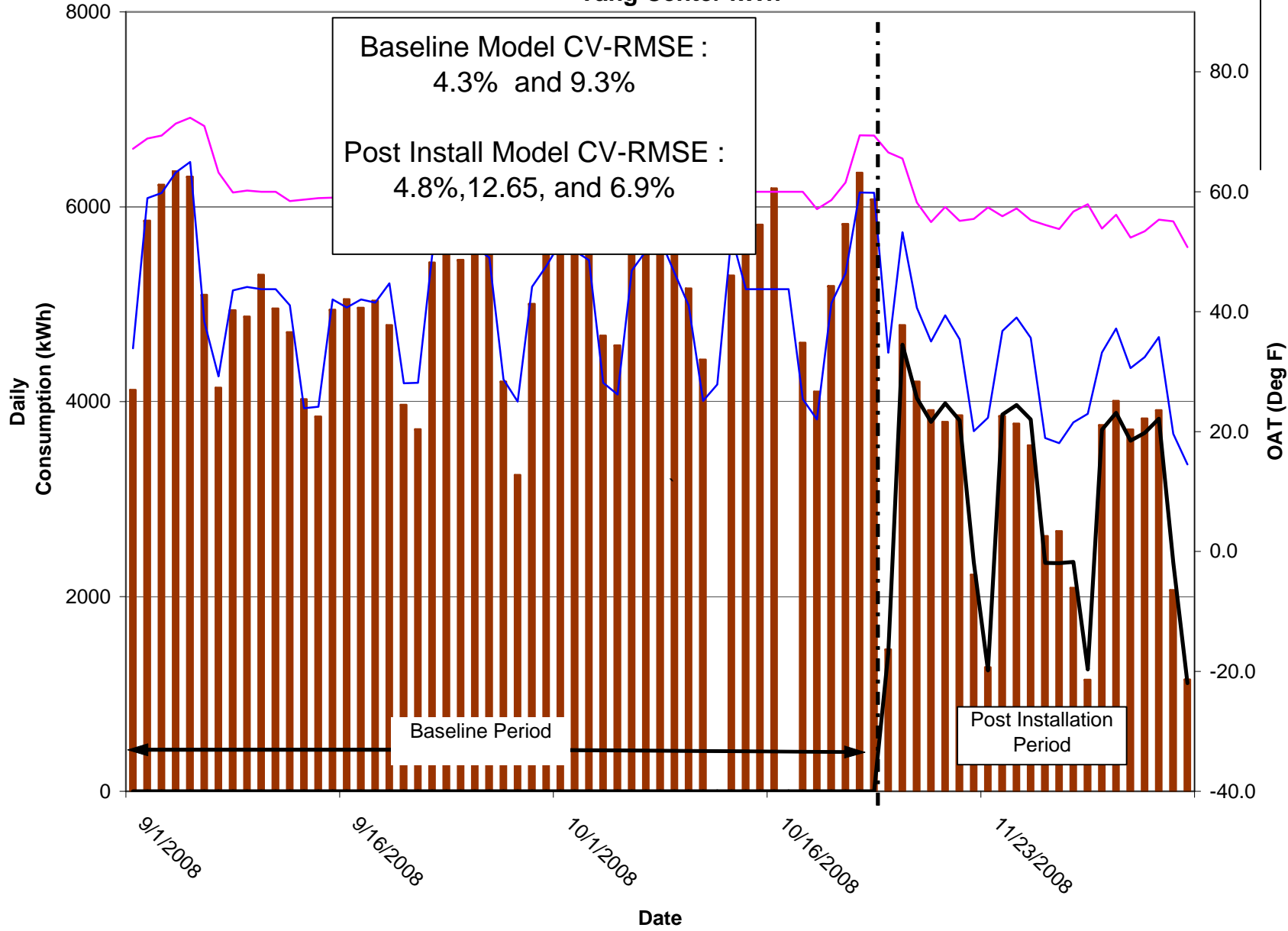


Measures implemented

- New control system was installed that allowed:
 - Scheduling. Operating DX units, boiler, and fans only while the areas served by them was occupied.
 - Supply air temperature reset. Reset the supply air temperature set point up and down with the number of requests from the zones so that the temperature better serves the demand in the space.
 - Boiler lockout. Lockout boiler with outside air temperature
- Other control sequence:
 - Reduction of duct static pressure set point. modulate inlet guide vanes to maintain 1.25 in. WC duct static set point instead of 1.5 in. WC thus reducing fan energy.

M&V Results - Electricity

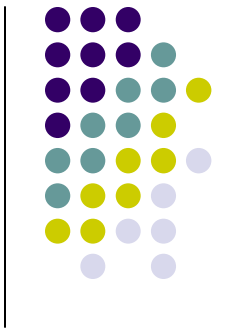
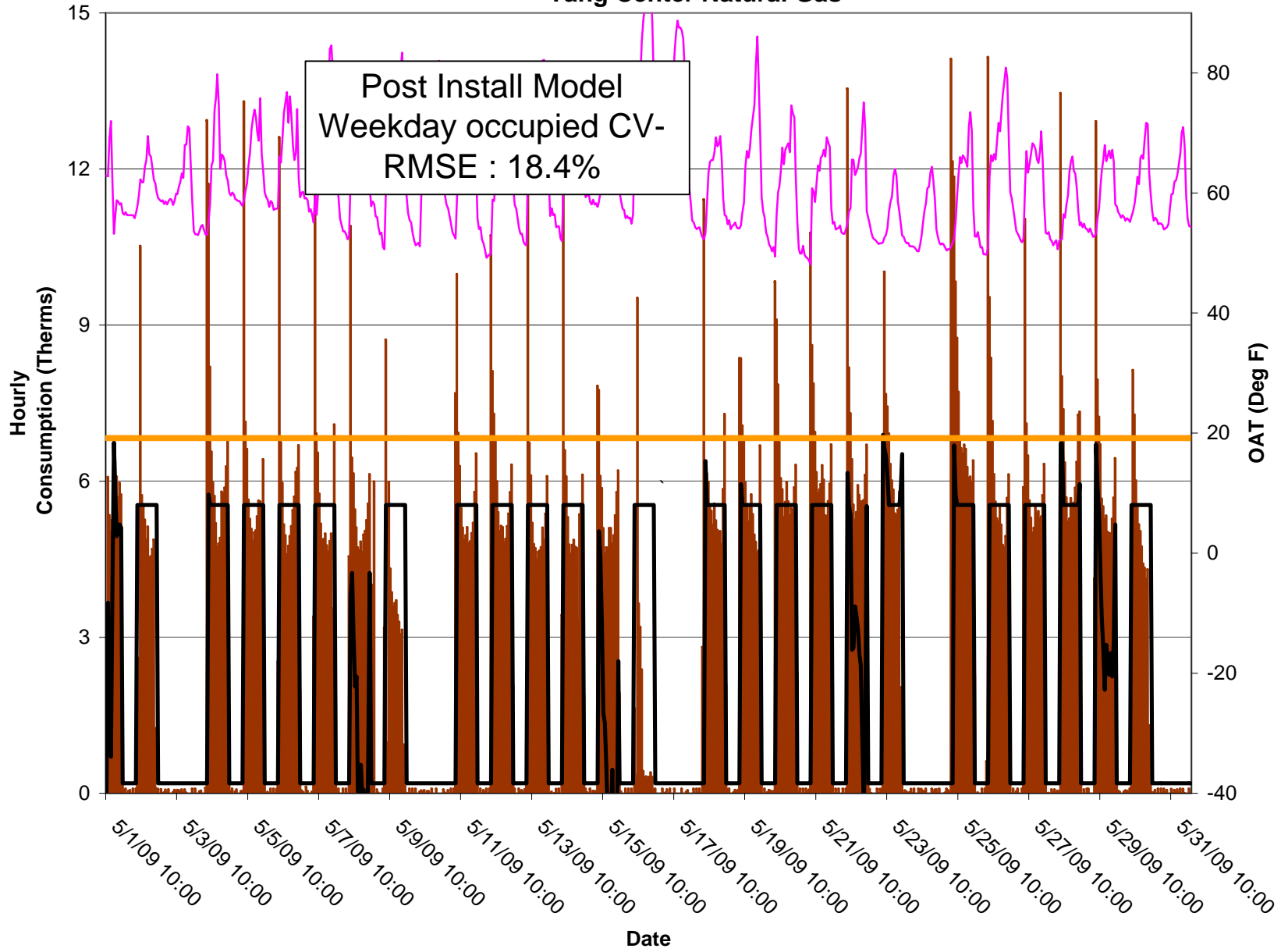
Tang Center kWh



Meter Baseline Model Post Install Model OAT

M&V Results – Natural Gas

Tang Center Natural Gas

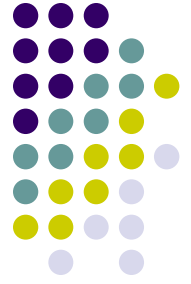


Meter Post Install Model Baseline Model(monthly) OAT

Things that worked well and lessons learned



- **Engineers focused not only on mechanical areas but also spent time in the zones especially with respect to the locations of temperature sensors.**
 - Some of these sensors had to be relocated because of proximity to zones that were unconditioned resulting in excessive cooling requests.
- **The building engineer and his input was invaluable.**
- **The project identified additional savings opportunities to be resolved in the future**
 - VAV box min and max damper positions and velocity controllers need calibration.
- **Gas meter was easily installed and connected to the new control system.**
 - PGE charges approximately \$1,500 to retrofit a meter with a pulse output.



Next Steps

The MBCx project was completed however the campus continues to follow-up on its recommendations:

- The DX units are being inspected and serviced
- The commissioning agent (QuEST) will verify DX unit operation following their servicing and address other general building system issues that were found during the MBCx project.
- QuEST will work with Air Systems Inc. to set up energy consumption tracking charts within the control system to continuously monitor energy use in comparison with historical models.